

HIFICRITIC

AUDIO REVIEW JOURNAL

£13.50 Vol6/No3 JULY - SEPT 2012

REVIEWED THIS ISSUE

GRADIENT HELSINKI
NAIM UNITISERVE
NAIM NDX
MAGICO Q1
LAMPIZATOR DAC
AURELIA CERICAS
AUDIO-TECHNICA AT-OC9MLII
ORTOFON RONDO BLUE
DYNAVECTOR KARAT 17D3
ZU AUDIO DENON DL103
NAIM NAC552 DC PS
UNITY AUDIO THE ROCK
THRAX DIONYSOS
CENTRANCE MINIDAC
RED WINE AUDIO S10 BLACK LIGHTNING
ELIPSON PLANET L
NOVO SPA-II
BLACK RHODIUM TWIST
CHORD SARUM DIGITAL
ATLAS ASIMI
ATLAS MAVROS
MEICORD CAT6
AUDIOQUEST FOREST ETHERNET
DNM HFTN

GRADIENT HELSINKI

A speaker with unique directivity and presentation

NAÏVE NETWORKING

A sceptic gets to grips with network audio

MINIATURE EXCELLENCE

Magico Q1 – probably the most advanced miniature speaker around

FOUR AFFORDABLE CARTRIDGES

Mid-price moving-coils, from Audio-Technica, Dynavector, Ortofon and Zu Audio

THE VALVE DAC

Mixing up the old and the new

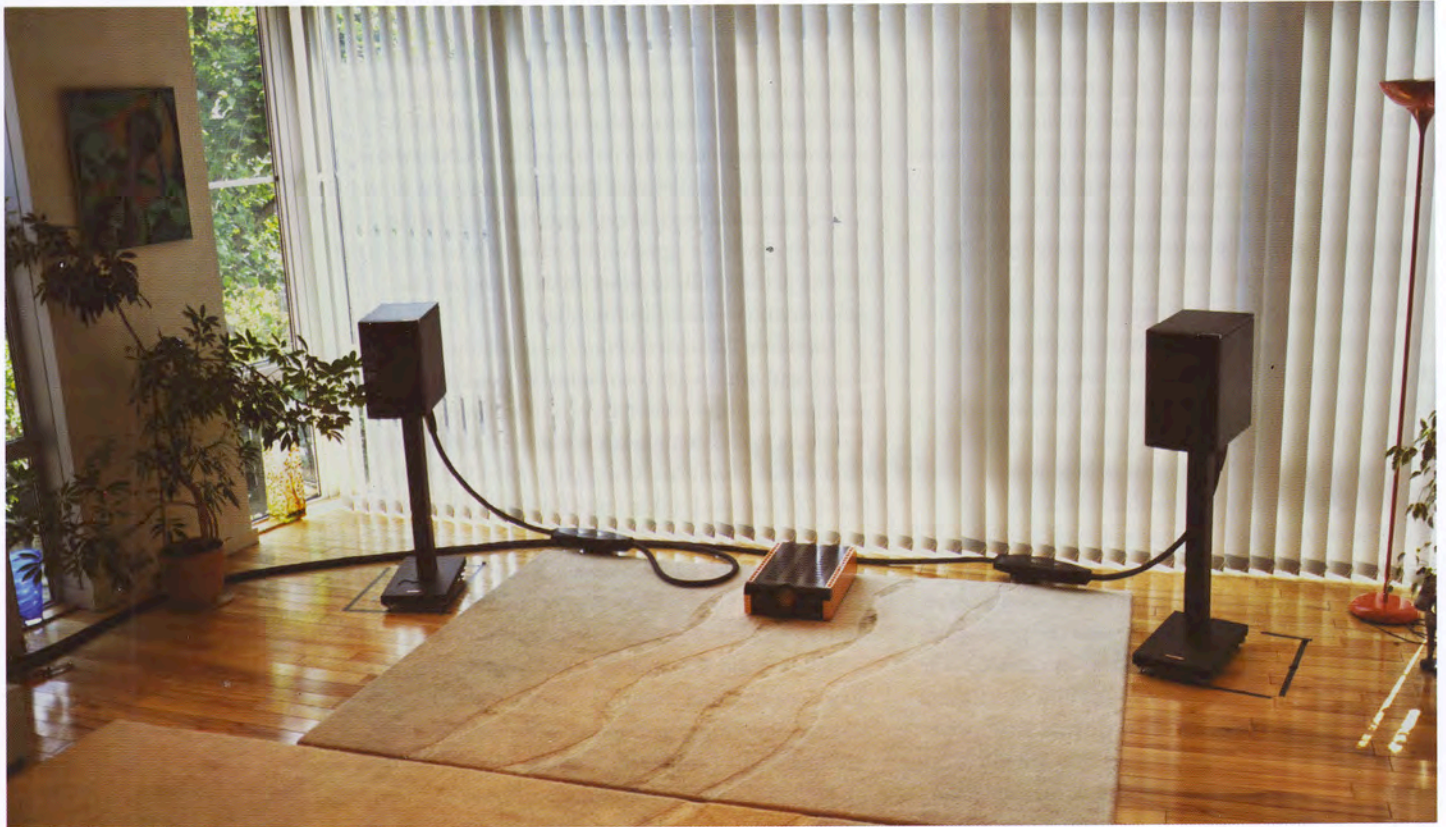
WHITHER DIGITAL?

Meridian's Bob Stuart describes the past, present and future of digital audio

MUSIC & MUCH MORE

Excellence in Miniature

MAGICO MAKES SOME OF MOST DRAMATICALLY ENGINEERED AND COSTLY SPEAKERS AROUND. MARTIN COLLOMS EXAMINES THE BABY Q1



Judged by the abundant interpretations of the art of loudspeaker system design, these frequently awkward objects remain manifestly imperfect, yet still have the ability to move us emotionally when replaying our choice of music. We greatly value our responses to reproduced music, endeavouring to repeat and even enhance them by (sometimes reluctantly) ascending the audiophile ladder. The pursuit of excellence is a human trait, so hi-fi remains a valued activity, even when incremental performance gains may be modest.

In offering a two-way stand-mount speaker for the extravagant price of £26,000/pair, California-based Magico clearly hopes the *Q1* will set standards that others can only aspire to. Knowing that conventional value for money considerations do not apply to its very costly products, the company is understandably cautious and careful about selecting its dealer network and in placing products for review. We are talking here of highly tuned products that have more in common with bespoke racing car technology than regular mass production. Obviously Magico tries very hard at what it does, so what is it after, and what can it do for us?

Minimising Noise

Having thought it through, I think the key factor is to do with minimising the noise floor, through painstaking control over unmusical stray noises – those sounds that make much loudspeaker reproduction faintly mechanical, detracting from naturalness and believability. Whether or not Magico designers achieve this sufficiently; whether that effort will be heard clearly and to full measure, will depend on the partnering system and whether the overall sound balance (especially the low frequency alignment) suits the room in which it is assessed. If these factors don't work out, much of that design and engineering effort may remain largely unappreciated.

To digress for a moment, a unique characteristic of the Quad electrostatic is an ultra low mass diaphragm, weighing just 20 thousandths of a gram, which consequently stores little energy and has low reaction forces. There is almost no enclosure either, to resonate or re-radiate reaction forces. Its sound is characteristically that of a well balanced 'low noise' reproducer with fast transients, though accompanying disadvantages of limited low bass and overall dynamic range have precluded its widespread adoption.

So, how can we make a moving-coil speaker sound more like an electrostatic? One step would be to reduce the noise floor to comparable levels. Top class reproduction requires very low self-noise from the loudspeaker at the very least, and while the ubiquitous moving-coil box loudspeaker can deal with many basic design issues, it also has inherent noise problems, and the enclosure is generally considered to be the worst offender. Heroic measures are frequently taken to combat such noise, using high density composite panels, mass anti-resonators and extensive bracing. While worthwhile improvements have slowly advanced the art, Magico appears to have said 'let's fix this for once and for all', employing a sledgehammer approach to cracking the self-noise problem. Consequently this *Q1* is one of the heavier stand-mounts around, at 27.2kg (60lb) each, plus the same again for the partnering stand.

Unwanted but inevitable reaction forces result from accelerating the diaphragm masses. A primary difficulty is that these forces are part-coupled to the natural resonances of the enclosure structure, where the comparatively large surface area results in significant energy radiation. Furthermore, drivers may resonate on their mountings, magnets may resonate on their driver chassis, and acoustic reflections and standing waves may be created behind the cone within the enclosure volume. Bigger and more powerful speaker systems will usually involve greater forces and a larger enclosure area to radiate noise, so the small radiating area of this compact enclosure is itself a benefit.

Drive Units

Then there are the drivers themselves. Here inherent harmonic and intermodulation distortions may also be regarded as noise. The motor of Magico's 180mm main driver has heavy copper shading rings in the neodymium magnetic system to minimise harmonic currents. Likewise cone suspensions are customised for optimum linearity, further reducing distortion 'noise'. The large diameter, high power (and hence thermally stable) short voice-coil operates in a long gap, holding any modulation of sensitivity and inductance due to coil excursion to a minimum. Many small speakers work quite well up to moderate power levels, degrading quickly when driven hard, but high power design and development is an important component of the research, and Magico has designed the *Q1* to deliver as much quality as possible over a wider than usual dynamic range. The low mass bass/mid driver has a low profile composite (sandwich) cone of nano-stranded carbon fibre skins on a Rohacell structural foam polymer core; the contour continues to its natural apex to confer

maximum strength. A titanium foil voice coil former aids stiffness and thermal capacity.

The top grade Scan-Speak tweeter has a beryllium dome diaphragm and curved path rear absorption. It has been extensively remanufactured with custom machined mountings, and is bolted right through the enclosure depth to minimise jitter.

While the ubiquitous moving-coil driver is inherently low in noise (it does not scrape or whirl in operation), in practical systems several other potential sources of noise remain. A bass reflex port may have a complex noise signature that varies with bass power, has tube resonances that may also selectively amplify the noise (including midband) that leaks out from inside the enclosure. The mass of air in the port is intentionally resonated with the air volume in the loudspeaker across a narrow range of bass frequencies to extend the response, but it can ring on after the music signal has stopped. To avoid such problems, Magico has adopted the sealed box (infinite baffle) approach. Bass extension, efficiency, and maximum loudness at low frequencies may all be less than found in the far more common reflex ported designs, but the noise floor can be significantly lower, and lower group delay, in theory conferring good timing, also comes with the choice.

Massive aluminium alloy stands are part of the overall mechanico-acoustic design, forming a coupled, vibration controlling interface to the loudspeaker. Indeed they are shipped ready fitted (so each ensemble weighs 120lbs when delivered!). Top quality stainless steel floor coupling hardware is part of the package.

The speaker is single wired with accessible well spaced heavy duty, copper core binding posts. The crossovers are hard-wired, with single strand, unbroken path cables. Augmented second-order alignment is used, with near perfect foil inductors and top grade Mundorf film/foil capacitors.

The fabricated sealed enclosure is bolted together from machined slabs of high quality aluminium alloy, reinforced by numerous cross-braces. It goes rather beyond brute force, leaving little to chance, and the whole assembly stands a little over a metre tall when spiked up.

Sound Quality

The normally resident Wilson Audio *Sophia 3s* were temporarily moved out of the way to make way for the Magico *Q1s*. These were given free rein in the listening room, seeking the best possible blend of extended response, low midrange coloration and generous, well focused stereo imaging. Optimised placement will also allow much of the inherent timing precision of the review speaker to be clearly



The System

Power amplifiers: D'Agostino *Momentum*, Krell *Evo 402e*. Pre-amplifiers: Audio Research *Reference 5SE*, Townshend *Allegri*. Speakers: Wilson *Sophia 3*, Quad *ESL63*, BBC *LS3/5a* (15ohm). Vinyl: Linn *LP12/Radikal/Keel*, Naim *Aro*, Koetsu *Vermilion*, Naim *Superline/Supercap*. Network audio; Naim *UnitiServe*, MSB *Platinum Signature DAC*, MSB Diamond Supply. Cables by Transparent, Yter, Van den Hul; Finite Elemente *Pagode* supports; plus numerous Synergistic *MIG* cups.

heard. My task is to see whether Magico can justify such a handsome investment.

The *Q1* delivers sufficiently even power across the frequency range that appropriate speaker and listener locations were remarkably similar to those used with other well tuned speakers such as the Wilson *Sophia 3*. The somewhat broader midrange directivity of this compact did require a few inches of lateral adjustment, inwards from the side walls; rather less space from the wall behind the speaker helped trim up low frequency uniformity and extension and control some midrange bloom. Sitting on semi-reclining listening chairs, I obtained the most open mid-treble with the speakers set almost to face me (within five degrees), with the top of the enclosure only just hidden (*ie* listening a little above the geometric mid-treble axis. Tilted low and the main treble was slightly deficient; angled too high, the upper mid leading edges sounded dulled, and the upper treble was then less well integrated.

The *Q1* is voiced to have a big sound, and not concede significant weight or scale to larger and comparably priced designs. Fortunately I found that unless it was kicked hard with deep synth bass (c30Hz stuff), the low frequency part of this speaker simply got on with the job. Eyes closed, one simply had no idea that it was so compact. Indeed, the bass was one of the joys, since it was quick, even, tuneful with good rhythmic ability; numerous acoustic double bass sections sounded notably revealing of performance and character. The bass and lower mid resolution is close to the state of moving-coil technology art, and really does approach the low

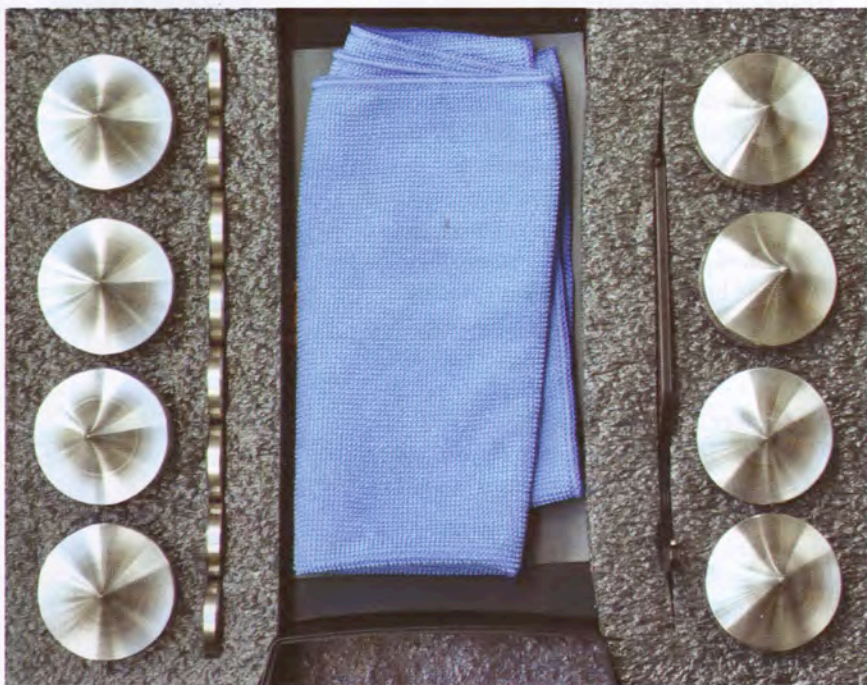
coloration of the best electrostatics. The treble also shows manifestly high resolution of subtle detail.

The mid is almost devoid of cone 'shout' and related 'mechanical' colorations often characteristic of moving-coil technology, and the transition to the treble is close to seamless, bearing in mind some audible variations with azimuth which can be used to fine tune this region at the listening seat. The treble is extraordinary in its smoothness, liquidity and low noise, and it digs deeply into instrumental colour and texture; a wind band with brass content was rendered almost free from any mechanical artefact: open, crisp, nuanced. The treble's micro detail was sometimes revelatory in its extreme precision and finely focused perspectives, though occasionally it seemed a little detached from the lower mid. Where present, program distortions like Aphexed vocals and their included grain and forced sibilance were clearly read.

Although I failed to get the final degree of image depth I know to be possible from my system, stereo depth was still very good indeed. The *Q1* was certainly transparent, but leant more towards high resolution, and showed a little less see-through quality than I had anticipated, perhaps due to a mild but inherent energy reticence in the upper mid to lower treble. Vocals were quite free of strain, low in coloration, with pure sweet articulation and fine clarity, while dynamics were occasionally mildly restrained. The bass was fast and tight and certainly as detailed as the midrange, but it seemed necessary to crack the whip a little harder on percussive transients to get the expected effect. Timbre is characteristically rich, and the *Q1* mildly softened the sound of the beater hitting a bass drum, here more felted than plain wood, when compared directly with a Quad *ESL63*. Thus the *Q1* will have some system dependency and a skilled dealer should be able to choose appropriate electronics and cables to best effect.

The resolution of close-miked and more immediate sounding material was sometimes extraordinary, revealing more from these mixes than ever before. Conversely, classically miked, well balanced recordings – some rock, ECM sourced jazz and classical – sometimes sounded a tad laid back, softened and less upbeat, requiring some mental and aural accommodation.

The very revealing *Q1* is a microscope for system set up and ancillaries, including whether the equipment is properly warmed up. Right out of the packaging, these well run demonstrators were manifestly uptight, lying as they do on their backs in transit. Once upright they settle in over a period of days, bearing in mind the huge 120lb thermal mass which takes a similar time to settle to ambient



temperature. (One saving grace is that the thermal conductivity of the metal enclosure conducts heat inwards more quickly than a wooden carcass.)

Listening the enclosure with a stethoscope to while playing music, the top is almost silent and the sides nearly so while producing a very quiet and pleasant sounding facsimile of the main output. This contrasts to the 'clanging bell' and hard 'knocking' sounds that usually emanate from enclosures, and which audibly degrade detail and the low level noise floor. Magico's massive construction undoubtedly pays off in the exceptionally well suppressed enclosure signature.

Lab Results

The *Q1* did not sound very sensitive, but the result is actually about right for the size and bass extension. I estimated 84-85dB/W subjectively, verified on measurement with a below average 84.5/W loudness for 1m from the responses of the pair. The amplifier loading is kinder than some, with modest phase angles, a mean value of 6ohms, and relatively benign minima of 4ohms at 20Hz and 3.7ohm at 15kHz. The system resonance is at 52Hz, the impedance rising to 50ohms. The absence of a reflex port does make the amplifier load easier, but valve amplifiers rated at less than 35W (4ohm) will be less suitable. Some valve amplifiers with higher output impedance may impart a mild low bass lift 'tone control' which might be helpful in some rooms.

Maximum sound levels of 103dBA will be possible in an average room on up to 200W peak programme but take care not to overdrive it as there is no false 'shout' and therefore not much aural warning of impending mechanical and thermal overload. It will take some abuse, but don't push it or an expensive repair may be required. Like the *Eidolon Diamond* there's a natural volume level, a sweet spot where maximum subjective clarity is obtained and there is no point in playing it any louder.

Nearfield measurement showed a bass extension to 46Hz for -3dB and 39Hz for -6dB. In-room bass goes down to 30Hz at sound levels which are above the audible threshold, which is impressive for a speaker of this size.

Measured near the prime axis (just 5 degrees out laterally, as advised), the composite main frequency response met quite close +/-3dB limits for the pair, with clean extension into the ultrasonic range thanks to the high (32kHz) first resonance of the beryllium tweeter dome, and with little peaking here (one tweeter to +4dB, the other +1dB).

The bass-to-midrange was uniform but the upper mid and lower treble was a little depressed, averaging -3.0dB over two octaves, 1.2kHz to 4.5kHz. This



is likely to be audible as a mild softening of leading edge mid transients, but conversely may also add some subjective scale and spaciousness.

The speaker showed some sensitivity to vertical axis variations, and while moving the mike up 15degrees the output showed a trough of 3dB from 2-4kHz, while below axis moving through similar angles a 4dB dip present was narrower spanning a third octave, here at 5kHz. Overall this is quite good behaviour with good driver integration, and conferring a fairly neutral floor bounce spectrum.

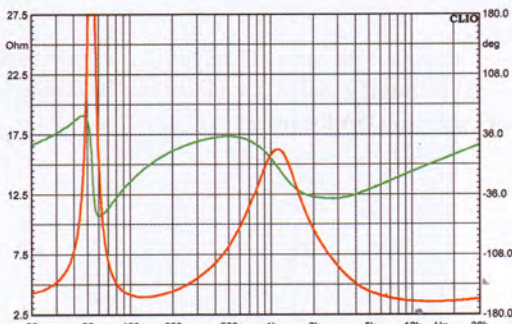
Image focus is related to the lateral off-axis results, the neutrality of early arrival reflections from the side walls, and the uniformity of the power response that's responsible for illuminating the entire room acoustic. Here the *Q1* showed good diffraction control at the enclosure sides but the responses nevertheless showed some characteristic shapes which could colour the sound; room treatment and reflection control may ameliorate these issues. In particular the off-axis energy trend rises a little to 1kHz and then reverses, leaving the 1kHz area exposed, while the lower treble is then dulled for all the lateral axes up to 90degrees. An energy prominence around 5kHz is characteristic of the whole curve set.

The more compressed scaling of the room average response also illustrated features which in my view may also relate to the small loss of deep perspective in the soundstage. However, by normal

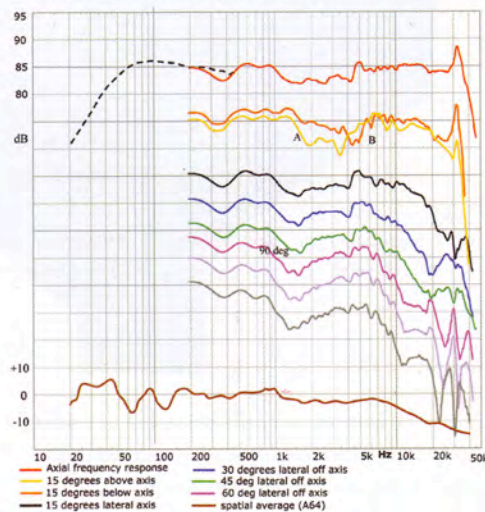


Contact: Absolute Sounds
Tel: 0208 971 3909
www.absolutesounds.com

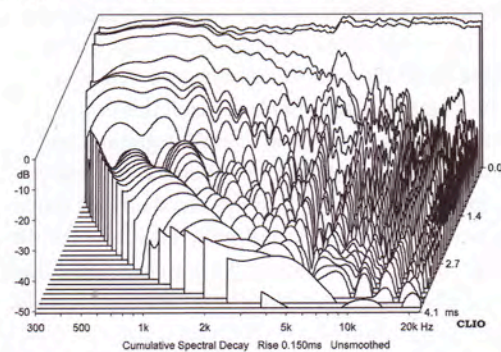
Magico Q1 Frequency Response: Impedance/Phase (green)



Magico Q1 Frequency Responses



Magico Q1 Energy v Time v Frequency Waterfall



HIFICRITIC Loudspeaker Results

Make	Magico, California, USA
Model	Q1: moving coil compact, stand mount, including stand
Price per pair	From £26,000
Finishes	Satin bead blasted, black anodised
Size (HxWxD); weight	38x 25.4x 38; 27.2kg; 60lb (stand +76cm: 60lb)
Type	Two-way, 180mm bass/mid, 25mm HF, infinite baffle loading
Sensitivity for 2.83V	84.5dB/W measured (8ohm Watt)
Amplifier loading	6 ohms typical, 3.7ohm min: average loading
Frequency response, axial	46Hz to 25kHz +/-3dB (listener axis) (see text)
Frequency Response, off-axis	Good plus, see graphs and in-room response
Bass extension	39Hz for -6dB, (30Hz in-room)
Max Loudness, in room	103dBA for a stereo pair
Power rating (max, min)	200W, 25W
Placement	Integral stand mounted, adjustable spikes and cups, near free space location

standards the low frequency response is very good, extending to a measured 25Hz, and well balanced relative to the midrange. Perhaps my room acoustic, which less well damped than many, showed more of the *Q1*'s off-axis frequency characteristic than would normally be heard.

Low frequency distortion was rated average, for example 40Hz at 1W (85dB spl) had 3.5% second and 0.25% third harmonic distortion. For 2W the two harmonics were 6% and 3% respectively, becoming audible, so the magic does have limits.

Although 200Hz can be a problem area for some speakers, the Magico excelled here, with 0.1% second harmonic, 0.08% third for 81dB; at a loud 88dB, second was 0.3% and third a commendable 0.12%. By 1kHz distortion was typically 0.05%, and stayed at excellently low electrostatic like levels right up to 88dB. The treble was equally excellent, 85dB at 5kHz gave 0.05% and 0.002% (second and third respectively) and 95dB spl resulted in just 0.2% second and 0.02% of third. (Third harmonic is the more important factor in these results in terms of audibility.)

Pair matching was rated 'good plus', measuring +/-1.5dB 200Hz to 25kHz, while the audibly low noise floor was also reflected in the waterfall representation of the decay responses with frequency. The linear and uniform clearing at the back of the graph also shows fine phase integration of the driver outputs and rapid early decays. Longer term decay is very good too, which correlates with the fine low level detail and intrinsically low coloration.

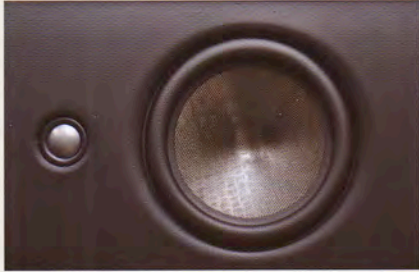
Conclusions

I had begun mentally comparing the *Q1* to a race bred vehicle: its power capability is exceptional for the size, as is its fast, well-timed bass. But the build precision and refinement, and well defined, tightly focused sound also brings to mind the parameters of the classic Leica camera brand.

I could live with the *Q1* for its clarity, focus, precision, low coloration and exceptional refinement, though in truth I need something bigger and with more impact to exercise larger power amplifiers. Every design is a combination of compromises, so one needs to establish how the mix of performance and size matches one's expectations. With the *Q1*, large, open plan listening rooms should not apply.

However, it does somehow provide much of the subtle naturalness and precision of an electrostatic, alongside a substantial helping of power, speed and bass extension, plus fine image focus, solving a problem for those seeking quality in a smaller package. As always, listening in the context of one's own material, system and room acoustic is advised.

Talking to Magico



MARTIN COLLOMS CHATS TO MAGICO'S ENGINEERING VP YAIR TAMMAN

Yair Tamman, Magico's engineering vice-president operates mainly in Israel, while Alon Wolf, chief design engineer is based at the California factory. The two work together on the development and fine tuning of the loudspeakers.

Tamman uses sophisticated FEA (finite element analysis) design software. (With FEA, the mechanical vibration behaviour problem is broken into minute finite elements with individual behaviours all linked in a massive mathematical net analyser.)

The main multi-physics solver is *COMSOL*, which can now integrate acoustic, mechanical, magnetic, and electrical facets of operation, allowing the behaviour of complete trial systems to be simulated, including synthesised crossovers and the drive units. In speaker terms this is approaching rocket science.

I asked Tamman whether low noise was a primary target.

"Yes, by minimising the levels of vibration induced by the audio signals. We optimise the structure of the enclosure, location and quantity of braces, ensure that the existing resonance frequencies are distributed evenly and then displaced for more efficient damping using custom developed counter layers and tensioning."

And what steps are specifically taken for the drivers?

"We use our proprietary clamping techniques to mount the drivers, using both layers of damping material, high end stuff (made in USA for space applications) and tensioning created by both tension rods and chassis bolting. For the main driver we design for maximum structural stability, for example by optimizing the bolts used to mount the magnet system to the chassis and bolting the driver mountings through to the back of the enclosure."

Regarding the crossover, elliptic or high initial roll-off filters have been mentioned. Are these to prevent leakage of 'noise' from one driver to another in their stop bands?

"We meet our idealised acoustic transfer function targets by controlling not only the crossover frequencies and shapes but also in combination with the driver's on and off axis response, including the power response, by controlling the cone profile. The elliptic crossovers, when they are used, are only a tool to help achieve the final target acoustic transfer function and this result is more important than absolute phase linearity."

But you ensure good phase control for low group delay in the bass?

"Sure, we keep our group delay to a minimum."

And long throw drivers, and short or long coil?

"We use large Xmax excursion, underhung motor systems, large voice coils, Titanium formers, and Neodymium N48H magnets, the latter FE magnet solver optimised; we also use FEA for the coupled suspension to the diaphragm."

And crossover design, vibration issues, mutual coupling, do you take any special precautions?

"All of that, I can say we don't leave anything to chance; the crossover is optimised by component choice, including top Mundorf capacitors and near-perfect foil inductors, also their

location and layout, both in respect of their mechanical and electrical behaviour."

What about the internal wiring?

"We use specially made wire, pure copper solid core, unique isolation (combination of lacquer and Teflon) with mixed gauges for each driver and it runs continuously from the input terminals, no intermediate breaks or connectors."

Since cycle time has been quite quick with some of your designs, what production life do you envisage for the *Q1*?

"The *Q* series is the best we can do now, though we will continue looking for ways to make better speakers. Innovation can happen in materials science (new magnets, damping, metal composites etc), in computer simulation, and in our psychoacoustic understanding. But I consider it will take few years of R&D to surpass the level we are currently achieving with the *Q* series."

What part does *COMSOL* play in the design process, in particular for the *Q1*?

"In the *Q1*, *COMSOL* was used practically for every step from meticulous structural analysis of the enclosure, through driver design, and finally combining everything together."

I asked Tamman about the unprotected beryllium dome tweeter, thinking of my grandson's inquisitive fingers, and happy that the material itself in the metal foil form used is safe. (In powder form the oxide is toxic.) But nonetheless, how to repair the tweeter? (Maybe an exchange plan should be devised, or as some do for their delicate and costly cartridge styli, include them in the house insurance?)

"It's a technician job, well documented and may be done in the field in one hour, but it's very costly as the tweeter is very expensive. You only have look at the custom machined mounting plate and matching enclosure with its complex internal formation for back wave diffusion."